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Response to Office Action of February 6, 2006

### **REMARKS**

This amendment is submitted to be fully responsive to the Office Action mailed February 6, 2006. Currently, claims 15, 20-22, 25, 29-37 and 39 are being considered. Claims 20 and 22 are rejected under 35 U.S.C. §102(b) as being anticipated by Verill et al. (U.S. Patent No. 5,938,800). Claims 29, 32-33, 35, 37 and 39 are rejected under 35 U.S.C. §102(a, e) as being anticipated by LaPierre et al. (U.S. Patent No. 6,348,278).

Claim 15 is rejected under 35 U.S.C. §103(a) as being unpatentable over LaPierre '278 in view of Prasad (U.S. Patent No. 5,226,932). Claim 21 is rejected under 35 U.S.C. §103(a) as being unpatentable over Verill '800 in view of Keskar et al. (U.S. Patent No. 6,106,591). Claim 25 is rejected under 35 U.S.C. §103(a) as being unpatentable over Verill '800 in view of Epp et al. (U.S. Patent No. 6,063,515). Claim 30 is rejected under 35 U.S.C. §103(a) as being unpatentable over LaPierre '278 in view of Han et al. (U.S. Patent No. 6,896,709). Claim 31 stands rejected under 35 U.S.C. §103(a) as being unpatentable over the applied references (LaPierre '278 in view of Han '709) and further in view of Epp et al. '515. Claim 34 stands rejected under 35 U.S.C. §103(a) as being unpatentable over LaPierre '278 in view of Sato et al. (U.S. Patent No. 5,658,681). Claim 36 stands rejected under 35 U.S.C. §103(a) as being unpatentable over LaPierre '278 in view of Edlund et al. (U.S. Patent No. 6,383,670).

Claim 20 stands rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claim 1 of U.S. Patent No. 6,923,944.

#### **Remarks Directed to Rejection of Claims 20 and 22 under 35 U.S.C. §102(b) as Being Anticipated by Verill et al. (U.S. Patent No. 5,938,800)**

The Federal Circuit has stated that anticipation under 35 U.S.C. §102 can be found only if a reference shows exactly what is claimed. *Titanium Metals Corp. v. Banner*, 778 F.2d 775, 227

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USPQ 773 (Fed. Cir. 1985). Furthermore, every element of the claimed invention must be identically shown in a single reference. *In re Bond*, 910 F.2d 831, 15 USPQ2d 1566 (Fed. Cir. 1990).

The Examiner states that Verill et al. discloses a gas purification system which includes a raffinate compressor disposed in the fluid communication with said outside channel (Figure 1 and column 8, lines 8-11). However, examination of Figure 1, column 6, lines 31-37 and column 8, lines 8-11 of Verill et al. shows that Verill et al. discloses a turbo expander 310 that depressurizes off-gases 315 which are then passed to the burner 220. Therefore, Verill et al. discloses a depressurizer of the raffinate rather than a "raffinate compressor" per claim 20. As such, Applicant submits that pending independent claim 20 and dependent claim 22 are not anticipated by Verill et al.

In light of the above remarks, reconsideration and withdrawal of the rejection as to claims 20 and 22 under 35 U.S.C. §102(b) as anticipated by Verill et al. is requested.

**Remarks Directed to Rejection of Claims 29, 32-33, 35, 37 and 39 under  
35 U.S.C. §102(a, e) as Being Anticipated by LaPierre et al. (U.S. Patent No. 6,348,278)**

LaPierre is cited as teaching a gas purification system comprised of a separate reactor 12, a purified system 14, and a burner 94 for combusting the raffinate produced by said reactor-purifier system to yield a heated exhaust gas 100, with the heat from said burner being used to heat said reactor-purifier system. However, examination of Figure 1, Figure 9 and column 9, lines 19-32 of LaPierre et al. shows that LaPierre et al. discloses a burner 94 for combusting the raffinate produced by a separate reactor 12 and a purified system 14 to yield a heated exhaust gas 100, with the heat from said burner being used to heat the reactor 12 only. Furthermore, as

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stated above and in contrast to the present invention, LaPierre et al. discloses a reactor 12 which is separate from a purified system 14.

Independent claim 29, in contrast to LePierre et al, recites "a burner for combusting the raffinate produced by said reactor-purifier system to yield a heated exhaust gas, heat from said burner being used to heat said reactor-purifier system". As anticipation under §102 can be found only if a reference shows exactly what is claimed as stated above, Applicant submits that LaPierre et al. lacks a teaching as to all the recitations of independent claim 29, and as such fails to anticipate claim 29 and those claims dependent therefrom.

Dependent claim 39 depends from claim 20. Claim 20 is not rejected as being anticipated by LaPierre et al. and as such claim 39 is believed to have been rejected in error. Claim 39 is now believed to be directed to patentable subject matter and in allowable form.

In light of the above remarks, reconsideration and withdrawal of the rejection as to claims 29, 32-33, 35, 37 and 39 under 35 U.S.C. §102(a, e) as being anticipated by LaPierre et al. is requested. Should this rejection be maintained, it is respectfully requested that the reference equivalent of a raffinate compressor be stated with greater specificity.

**Remarks Directed to Rejection of Claim 15 under 35 U.S.C. §103(a)  
over LaPierre et al. in View of Prasad (U.S. Patent No. 5,226,932)**

LaPierre is cited as teaching all of the elements of claim 29 with the exception of a feed liquid compression means to convey the mixed gas to the reactor. To bolster the teachings of LaPierre et al., Prasad is cited as teaching a compressor 2 used to elevate the pressure of the feed gas to the desired upper membrane pressure to facilitate the separation process.

Claim 15 depends from claim 29 which is now believed to be in allowable form. On the basis of this dependency, claim 15 is likewise believed to be in allowable form. Additionally,

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Applicant submits that there is no motivation in the prior art of record for two stage pumping and compression of the feedstock.

In light of the above remarks, reconsideration and withdrawal of the rejection as to claim 15 under 35 U.S.C. §103(a) over LaPierre et al. in view of Prasad is requested.

**Remarks Directed to Rejection of Claim 21 under 35 U.S.C. §103(a)  
over Verill et al. in View of Keskar et al. (U.S. Patent No. 6,106,591)**

Verill et al. is cited as teaching the claim elements of independent claim 20 with the exception of a compressor of the type of a venturi. However, the Examiner states that Verill et al. discloses a turbo expander 310 which has the same function of depressurizing the off-gases as the claimed venturi. Therefore, the Examiner states it would have been obvious in view of Verill to one having ordinary skill in the art to substitute the compressor of the venturi type in lieu of the turbo expander in order to decrease the pressure of the off-gases since the turbo expander and the venturi are equivalents known for the same purpose by one skilled in the art. Alternatively, the Examiner states that Keskar et al. discloses a venturi educator 108 to reduce the pressure of a retentate stream 89 in order to achieve a desired recirculation rate for the exhaust gas stream.

Claim 21 depends from claim 20 which is now believed to be in allowable form. On the basis of this dependency, claim 21 is likewise believed to be in allowable form.

Regarding the teachings of Keskar et al., the venturi educator 108 is used to obtain a desired recirculation rate of the exhaust gas stream 94. Furthermore, a retentate purge gas stream and a high pressure reactive gas stream 100 are combined to form gas stream 107 which is used as a pressure driver gas stream to pass through the venturi educator 108. In contrast, venturi 228 of the present invention is fed by raffinate 226 from reactor 222. Therefore, the combination of Verill et al. with Keskar et al. would provide a venturi fed by a high pressure driver gas stream

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107 to form purge gas stream 111 which would reenter compact fuel processor 20 and not supply off-gases 315 to burner 220. This combination does not disclose the invention provided in claim 21 of the present invention.

In light of the above remarks, reconsideration and withdrawal of the rejection of claim 21 under 35 U.S.C. §103 over Verill et al. in view of Keskar et al. is requested.

**Remarks Directed to Rejection of Claim 25 under 35 U.S.C. §103(a)  
over Verill et al. in View of Epp et al. (U.S. Patent No. 6,063,515)**

Verill et al. is cited as teaching the claim elements of independent claim 20 and dependent claim 25 with the exception of an oxygen sensor. To bolster this limitation of Verill et al., Epp et al. is cited as teaching an oxygen sensor 361 at the burner outlet stream 321 of the catalytic burner 319 to maintain the oxygen concentration of the burner outlet stream.

In addition to Verill et al. failing to disclose at least one of an oxygen sensor, this prior art reference also fails to teach a mixed gas flow feed pump and a raffinate back pressure controller. In addition, the combination of the oxygen sensor 361 of Epp et al. with the fuel conversion system 10 of Verill et al. provides for an oxygen sensor that detects the oxygen content of hot fluid gases 250 produced by the burner 220, but with no ability to control fan means 280. In the alternative, if the oxygen sensor 361 of Epp et al. has the ability to control the oxygen input into the burner 220 of Verill et al., then the cryogenic pump 357 of Epp et al. must be included. This combination of an oxygen sensor 361 with a cryogenic pump 357 drawing oxygen from a liquid oxygen storage container 308 is not disclosed in the present invention.

In light of the above remarks, reconsideration and allowance of claim 25 under 35 U.S.C. §103(a) over Verill et al. in view of Epp et al. is requested.

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**Remarks Directed to Rejection of Claim 30 under 35 U.S.C. §103(a)  
over LaPierre et al. in View of Han et al. (U.S. Patent No. 6,896,709)**

LaPierre et al. is cited as teaching all of the elements of claim 29 and claim 30 with the exception of a mix controller to adjust the ratio of the raffinate and the air to the burner. To bolster the teaching of LaPierre et al., Han is cited as teaching a mix controller with a raffinate controller 23 and an air/fuel control valve 2 to regulate the amount of gas mixture to the catalyst burner 9 to be utilized as a fuel source, which increases the energy efficiency of the fuel reformer.

With respect to claim 30, as this claim depends from claim 29 which is now believed to be in allowable form, on the basis of this dependency claim 30 is likewise believed to be in allowable form. In addition, the pressure controller 23 of Han et al. is used to control the pressure of hydrogen separation reaction chamber 7 and valve 2 supplies fuel which does not permeate through metal films 11 in the unit modules to a combustion catalyst chamber in the respective unit modules. A combination of LaPierre et al. with Han et al. provides for a pressure controller 23 which controls the pressure of hydrogen separating membrane 14 or possibly reforming reactor 12 and a valve 2 that supplies fuel thereto. This combination does not provide for a mix controller adjusting the ratio of said raffinate in said air provided to a burner.

In light of the above remarks, reconsideration and withdrawal of the rejection as to claim 30 under 35 U.S.C. §103(a) over LaPierre et al. in view of Han et al. is requested.

**Remarks Directed to Rejection of Claim 31 under 35 U.S.C. §103(a)  
over LaPierre et al. in View of Han et al. and Further in View of Epp et al.**

LaPierre et al. in view of Han et al. is cited to disclose the claimed invention of claims 30 and 31 with the exception of an oxygen sensor. Epp et al. is cited to bolster the teachings of LaPierre et al. in view of Han et al. by providing an oxygen sensor 361 at the burner outlet

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stream 321 of the catalytic burner 319 to maintain the oxygen concentration of the burner outlet stream and control the amount of oxygen to the burner via pump 357.

With respect to claim 31, as this claim depends from claim 30 which is now believed to be in allowable form, on the basis of this dependency claim 31 is likewise believed to be in allowable form.

The Federal Circuit has stated that a single line in a prior art reference should not be taken out of context and relied upon with the benefit of hindsight to show obviousness. *Bausch & Lomb, Inc. v. Barnes-Hind/Hydrocurve, Inc.*, 796 F.2d 443, 230 USPQ 416 (Fed. Cir. 1986). Furthermore, determination of obviousness cannot be based on the hindsight combination of components selectively culled from the prior art to fit the parameters of the patented invention. *ATD Corp. v. Lydall, Inc.*, 159 F.3d 534, 48 USPQ2d 1321 (Fed. Cir. 1998).

In addition, the combination of the oxygen sensor of Epp et al. with the teachings of LaPierre et al. in view of Han et al. provides for an oxygen sensor that controls the amount of oxygen to the burner via a cryogenic pump 357 which draws oxygen from a liquid oxygen storage container 308. The cryogenic pump 357 and the liquid oxygen storage container 308 are not disclosed in the present invention.

In light of the above remarks, reconsideration and withdrawal of the rejection of claim 31 under 35 U.S.C. §103(a) over LaPierre et al. in view of Han et al. and further in view of Epp et al. is requested.

**Remarks Directed to Rejection of Claim 34 under 35 U.S.C. §103(a)  
over LaPierre et al. in View of Sato et al. (U.S. Patent No. 5,658,681)**

LaPierre et al. is cited as disclosing the claimed invention of claim 34 except for a feed pump controller to adjust the feed rate in response to hydrogen output pressure. Sato et al. is

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cited to bolster the teaching of LaPierre et al. by providing a feed pump controller 66 operated on a feed pump 30 to control the amount of feed into the fuel processing system 10 based on the amount of reformed gas produced.

With respect to claim 34, as this claim depends from claim 29 which is now believed to be in allowable form, on the basis of this dependency claim 34 is likewise believed to be in allowable form. In addition and as noted by the Examiner, Sato et al. discloses a feed pump controller that controls the amount of feed into the fuel processing system 10 based on the amount of reformed gas produced and not on the hydrogen output pressure as disclosed in the present invention. Therefore, the combination of LaPierre et al. in view of Sato et al. provides for an integrated fuel cell system 10 with a controlling system 66 operating on a liquid pump 85 to control the amount of hydrocarbon stream 19 sent to vaporizer 87. This combination is not disclosed in the present invention.

In light of the above remarks, reconsideration and withdrawal of the rejection as to claim 34 under 35 U.S.C. §103(a) over LaPierre et al. in view of Sato et al. is requested.

**Remarks Directed to Rejection of Claim 36 under 35 U.S.C. §103(a)  
over LaPierre et al. in View of Edlund et al. (U.S. Patent No. 6,383,670)**

LaPierre et al. is cited as teaching the elements of claim 36 except for a fuel flow controller to adjust the rate of the additional fuel flow in response to the temperature of the reactor-purifier system. Edlund et al. is cited to bolster the teaching of LaPierre et al. by providing a controller 28 used to control the temperature in the hydrogen-producing region 34 by adding additional fuel as required to maintain the temperature in the catalyst bed.



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With respect to claim 36, as this claim depends from claim 35 which is now believed to be in allowable form, on the basis of this dependency claim 36 is likewise believed to be in allowable form.

In addition, Edlund teaches a controller 28 used to control the temperature in the hydrogen-producing region 34 by adding additional fuel to the combustion region 60 as required to maintain the temperature in the catalyst bed. Thus a combination of LaPierre et al. and Edlund et al. provides for a fuel cell integrated system 10 with a controller 28 that provides additional fuel to a combustion region 60. The present invention discloses a fuel flow controller which adjusts the rate of additional fuel flow to the reactor-purifier system. These elements are not disclosed by the combination of LaPierre et al. in view of Edlund et al.

In light of the above remarks, reconsideration and withdrawal of the rejection as to claim 36 under 35 U.S.C. §103(a) over LaPierre et al. in view of Edlund et al. is requested.

**Remarks Directed to Rejection of Claim 20 on the Ground of Nonstatutory Obviousness-Type Double Patenting over Claim 1 of U.S. Patent No. 6,923,944**

As noted by the Examiner, a nonstatutory obviousness-type double patenting rejection is appropriate where the conflicting claims are not identical, but at least one examined application claim is not patentably distinct from the reference claim(s) because the examined application claim is either anticipated by, or would have been obvious over, the reference claim(s). Claim 1 of U.S. Patent No. 6,923,944 does not disclose a raffinate compressor disposed in fluid communication with said outlet channel, and claim 20 of the present invention does not require a reaction catalyst coating in contact with the interior side of the wall. Therefore, claim 1 of the '944 patent and claim 20 of the present invention are patentably distinct.

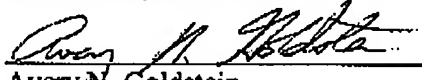
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In light of the above remarks, reconsideration and withdrawal of the rejection of claim 20 on the ground of nonstatutory obviousness-type double patenting over claim 1 of U.S. Patent No. 6,923,944 is requested.

**Summary**

Claims 15, 20-22, 25, 29-37 and 39 are submitted for consideration. Each claim is believed to be in allowable form and directed to patentable subject matter. Reconsideration and withdrawal of the outstanding rejections and the passing of this application to issuance are solicited. Should the Examiner find to the contrary, he is respectfully requested to contact the undersigned attorney in charge of this application to resolve any remaining issues.

Respectfully submitted,

  
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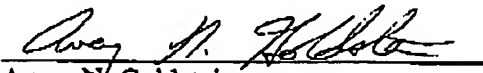
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**CERTIFICATE UNDER 37 CFR 1.8(a)**

I hereby certify that this correspondence is being sent to the United States Patent Office via facsimile (571-273-8300) on June 6, 2006.

  
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